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STANDARD CHLORINE OF DELAWARE, INC.

GOVERNOR LEA ROAD ● P.O BOX 319 ● DELAWARE CITY, DELAWARE 19706

100395

January 19, 1990 JAN 19 1990

Ms. Diane Wehner
Environmental Scientist
DNREC
715 Grantham Lane
New Castle, Delaware 19720

Dear Ms. Wehner:

In accordance with Paragraph 6 of the Consent Order between Standard Chlorine of Delaware, Inc. and the Delaware Department of Natural Resources and Environmental Control, we are hereby submitting the Eighth Quarterly Groundwater Monitoring Report.

Please feel free to contact me if you have any questions.

Sincerely,

Robert J. Touhey, P.E.
Assistant Vice President
Environmental Affairs

RJT/dab
Enclosure

cc: A. R. Sinibaldi
T. E. Pierson
B. V. Bowers

AR307796

QUARTERLY MONITORING REPORT
GROUNDWATER RECOVERY OPERATIONS

STANDARD CHLORINE OF DELAWARE, INC.
DELAWARE CITY, DELAWARE

Lyn R. Lawlor, P.G.
Project Geologist

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19 January 1990

Prepared By:

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WESTON

QUARTERLY MONITORING REPORT
GROUNDWATER RECOVERY OPERATIONS

STANDARD CHLORINE OF DELAWARE, INC.
DELAWARE CITY, DELAWARE

In response to the 22 January 1988 Consent Order between the Delaware Department of Natural Resources and Environmental Control (DNREC) and Standard Chlorine of Delaware, Inc., this quarterly report has been prepared to document monthly withdrawal rates and contaminant recovery at the pumping wells; and quarterly sampling results and water level data for the recovery and monitor wells. The report also contains an evaluation of the effectiveness of the recovery system and recommendations to improve the system. Documentation presented in this report covers the quarterly period from October to December 1989.

EVALUATION OF THE RECOVERY SYSTEM

The average monthly withdraw rates from recovery wells RW-1 through RW-4 are presented in Table 1. Average monthly withdraw rates from RW-1 through RW-4 ranged between 1.7 and 33 gpm.

A higher capacity pump was installed in RW-1 beginning on 29 September and accounted for 4 down days in October. Due to the installation of the higher capacity pump, puming rates at RW-1 have increased significantly over those recorded in the previous quarter. Recovery well RW-1 pumped almost continuously during November and December, except for a short period of down time in November due to scheduled maintenance. The flow meter on RW-1 became inoperable for several days in November, however, well discharge continued at an estimated rate of 33 gpm. A new flow meter was installed on RW-1 on 15 December.

Recovery well RW-2 pumped almost continuously during October and November, except for short periods of down time due to scheduled maintenance. RW-2 was not pumping for eight days during the month of December due to an electrical malfunction and scheduled maintenance. Pumping rates for RW-2 have decreased each month this quarter to an average of 1.7 gpm during the month of December.

Recovery well RW-3 pumped almost continuously during this quarter, except for short periods of down time in October and November due to scheduled maintenance. Pumping rates have averaged between 6.7 and 7.5 gpm for this quarter.

Recovery well RW-4 pumped almost continuously during the month of October, except for a short period of down time for scheduled maintenance. An automatic water level control device was installed on 10 October. All recovery wells currently have a water level control device in operation. Recovery well RW-4 was shut down for installation of a higher capacity pump on 9 November. Equipment operational problems following the new pump installation resulted in several days of down time in November and December.

Groundwater level data collected at the recovery and monitoring wells on 28 December 1989 were used to construct a water level contour map presented in Figure 1. This map represents actual water levels observed while recovery wells RW-1, RW-2, and RW-3 were pumping. A complete summary of these water level data is presented in Table 2. Water level elevation at RW-1 decreased from a September 1989 elevation of approximately 9 feet above sea level to a December 1989 approximate elevation at mean sea level. This reduction in water level elevation at RW-1 corresponds with an increase of pumping rates from an average of 9.3 gpm in September to an average of 33 gpm in December.

A comparison of the water level measurements at monitor well TW-63 for the months of September and December 1989, show approximately 0.6 feet of additional drawdown in December. This drawdown is a result of the increased pumping rate at RW-1 this quarter.

Monthly concentrations of organics recovered at RW-1, RW-2, RW-3 and RW-4 are presented in Table 3. The average monthly concentrations of total benzene species at the recovery wells RW-1 and RW-4 ranged from 41.32 to 79.17 mg/L. Recovery well RW-2 showed average concentration of approximately 228 mg/L total benzene species for the quarter. Recovery well RW-3 showed an average concentration of approximately 121 mg/L total benzene species for the quarter. A summary of the total and individual benzene species from the 6 December 1989 sampling event are presented in Tables 4 and 5 respectively. An isoconcentration map of total benzene species is presented in Figure 2. This map reflects a decrease in the total benzene concentrations as compared to the last quarterly report, to a level below 300 mg/L total benzene species.

Summaries of monthly and cumulative groundwater withdrawals and contaminant recovery for each well and for the total recovery system for 1989 were prepared. The data for individual recovery wells are presented in Tables 6, 7, 8 and 9; the monthly and cumulative results for the entire system

are presented in Table 10. The data indicates that the total benzene species recovered has increased reflecting an overall system wide increase in pumping rates.

RECOMMENDATIONS

1. An assessment of the well yield and available drawdown at RW-4 should be performed following the reinstallation and start-up of the higher capacity pump. The results of the assessment will be used to determine the optimal pumping rate at this recovery well.

2. Recovery well RW-3 should be tested with a higher capacity pump to determine the optimal pumping rate and maximize drawdown.

3. If pumping rates at RW-2 continue to decrease or fail to maintain adequate levels during the next quarter, the well should be rehabilitated by means of mechanical surging and/or chemical treatment

4. The drilling contractor has been selected and all required permits have been procured to proceed with the installation of the new recovery well (RW-5) near TW-6A. This well installation is scheduled to begin the week of 22 January 1990.

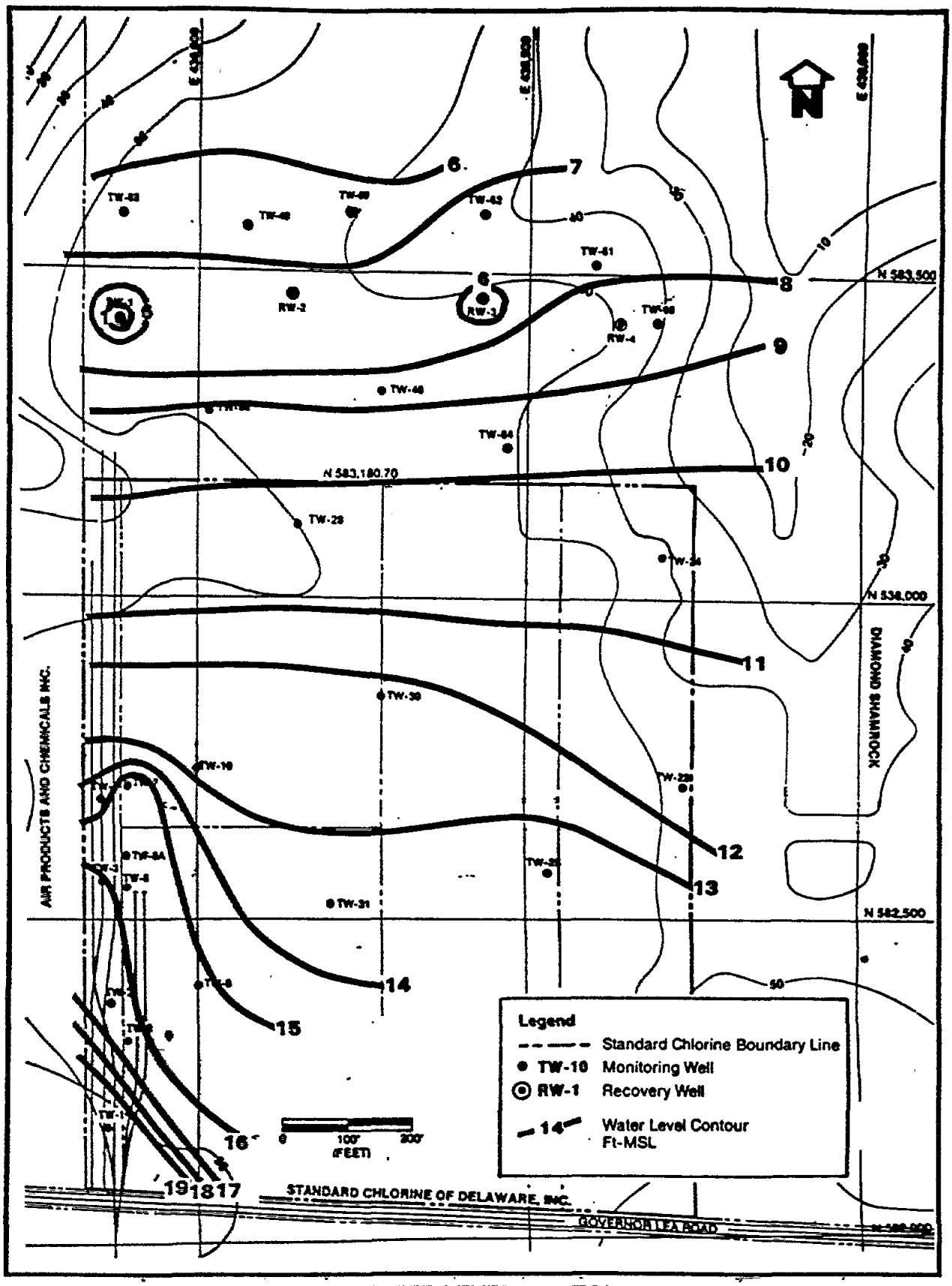

FIGURE 1 WATER LEVEL CONTOUR MAP
28 DECEMBER 1989

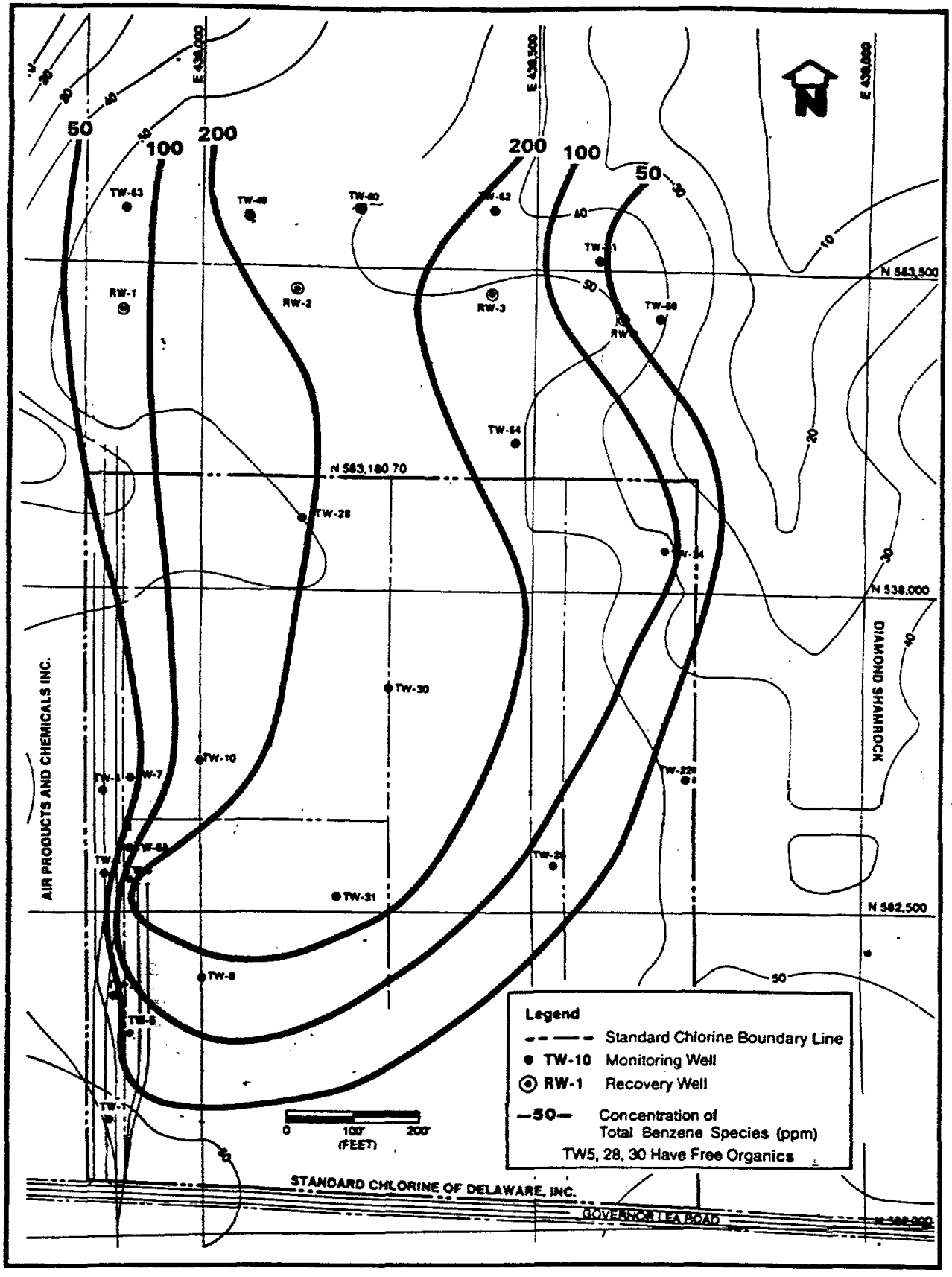

FIGURE 2 ISOCONCENTRATION MAP OF TOTAL BENZENE SPECIES, 6 DECEMBER 1989

TABLE 1

AVERAGE MONTHLY WITHDRAWL RATES (GPM)
GROUNDWATER RECOVERY WELL SYSTEM

STANDARD CHLORINE OF DELAWARE, INC.

MONTH (1989)	RW-1	RW-2	RW-3	RW-4
October	14.9 PD = 6 days	2.8 PD = 2 days	6.7 PD = 2 days	9.7 PD = 2 days
November	33* PD= 2 days	2.9 PD = 2 days	7.3 PD = 2 days	9.9 PD = 21 days
December	31.6	1.7 PD = 8 days	7.5	7.3 PD = 14 days

PD - pump down

* - estimated; flow meter inoperable for a portion of the month.

TABLE 2

GROUNDWATER LEVEL DATA
STANDARD CHLORINE OF DELAWARE, INC.
28 DECEMBER 1989

Location	Measuring Point Elevation (Ft. MSL)	Depth to Water (Ft.)	Groundwater Elevation (Ft. MSL)
TW-1	49.90	30.08	19.82
TW-2	56.10	39.92	16.18
TW-3	56.30	40.33	15.97
TW-4	55.00	40.42	14.58
TW-5	50.10	33.92	16.18
TW-6	50.70	35.08	15.62
TW-7	50.40	35.16	15.24
TW-8	52.20	*	*
TW-10	50.50	37.92	12.58
TW-22	**	40.16	**
TW-24	49.44	38.92	10.52
TW-25	49.44	36.08	13.36
TW-28	52.82	42.50	10.32
TW-30	52.29	40.08	12.21
TW-31	50.36	36.92	13.44
TW-49	55.71	48.92	6.79
TW-50	53.28	47.16	6.12
TW-60	46.44	37.83	8.61
TW-61	45.50	37.92	7.58
TW-62	48.92	41.83	7.09
TW-63	53.83	47.25	6.58
TW-64	53.48	*	*
RW-1	54.75	54.66	0.09
RW-2	52.99	45.66	7.33
RW-3	45.55	40.50	5.05
RW-4	48.08	39.50	8.58

* unable to take measurements, well temporarily inaccessible.

** Additional riser pipe added to well, elevation undetermined.

TABLE 3

MONTHLY CONCENTRATIONS OF TOTAL BENZENE SPECIES (mg/L)
GROUNDWATER RECOVERY WELLS

STANDARD CHLORINE OF DELAWARE, INC.

MONTH (1989)	RW-1	RW-2	RW-3	RW-4
October	41.32	242.02	114.55	44.18
November	58.69	213.65	120.87	46.54
December	79.17	228.54	127.79	49.30

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TABLE 4

QUARTERLY SAMPLING RESULTS
MONITOR AND RECOVERY WELLS

STANDARD CHLORINE OF DELAWARE, INC.

6 DECEMBER 1989

Location	Total Benzene Species Concentrations (mg/l)
TW-1	21.69
TW-2	0.53
TW-3	0.33
TW-4	0.80
TW-5	*
TW-6	230.40
TW-6A	78.01
TW-7	21.78
TW-8	189.95
TW-10	131.45
TW-22	3.81
TW-24	101.65
TW-25	80.19
TW-28	*
TW-30	*
TW-31	250.77
TW-49	291.72
TW-50	275.44
RW-1	75.54
RW-2	235.91
RW-3	126.14
RW-4	49.30

* Free organics in well

TABLE 5

WATER QUALITY DATA
INDIVIDUAL BENZENE SPECIES
MONITOR AND RECOVERY WELLS
STANDARD CHLORINE OF DELAWARE, INC.
6 DECEMBER 1989

Well	pH	C6H6	MONO	META	PARA	ORTHO	135	124	123	NB	1245	1234	MCNB	PENTA	HEXA	TOTAL CHLORO-BENZENES
TW-1	6.6	0.24	17.22	0.16	2.24	1.29	0	0.50	0.03	0.01	0	0	0	0	0	21.69
TW-2	7.0	0.05	0.14	0.01	0.10	0.09	0	0.09	0.01	0.02	0.01	0	0	0.01	0	0.53
TW-3	6.8	0.03	0.11	0.01	0.08	0.07	0	0.02	0	0	0.01	0	0	0	0	0.33
TW-4	6.9	0.05	0.14	0.01	0.22	0.22	0	0.12	0.01	0.01	0.03	0	0	0	0	0.80
TW-5		FREE ORGANICS														
TW-6	6.8	84.07	88.58	1.26	9.20	46.78	0	0.43	0.05	0.03	0	0	0	0	0	230.40
TW-6A	6.7	0.73	44.61	0.60	4.58	26.45	0	0.89	0.11	0	0.03	0	0	0.01	0	78.01
TW-7	7.0	1.03	2.29	1.57	11.16	3.61	0	0.80	0.91	0	0.04	0.35	0	0.02	0	21.78
TW-8	6.5	33.41	97.69	1.03	6.44	44.60	0	5.06	1.06	0.07	0.07	0.47	0	0.05	0	189.95
TW-10	6.3	37.46	30.05	4.27	49.69	8.38	0	0.86	0.49	0.06	0.06	0.12	0	0.01	0	131.45
TW-22	8.3	0.24	1.24	0.09	1.21	0.77	0	0.14	0.02	0.03	0.02	0.04	0.01	0	0	3.81
TW-24	6.6	0.58	1.76	0.76	12.69	85.36	0	0.45	0.04	0.01	0	0	0	0	0	101.65
TW-25	1.7	0.55	0.93	0.63	13.82	64.15	0	0.61	0.02	0	0.02	0.01	0	0	0	80.19
TW-28		FREE ORGANICS														
TW-30		FREE ORGANICS														
TW-31	1.7	99.33	75.95	2.05	33.75	25.69	0	12.07	0.65	0.02	0.45	0.81	0	0	0	250.77
TW-49	6.0	103.55	113.95	3.11	36.35	30.05	0	3.57	0.27	0.07	0.47	0.32	0	0.03	0	291.72
TW-50	1.7	112.79	89.53	4.35	32.46	31.50	0	1.62	0.48	2.46	0.07	0.03	0.15	0	0	275.44
RW-1	5.9	14.10	23.67	2.84	21.21	11.94	0	0.11	1.65	0	0.01	0	0.01	0	0	75.54
RW-2	4.3	83.02	90.15	2.02	28.42	23.89	0	4.91	1.02	0.86	0.12	1.40	0.01	0.09	0	235.91
RW-3	4.2	19.79	25.16	7.30	23.60	37.25	0	3.27	2.05	1.20	0.03	5.96	0.47	0.06	0	126.14
RW-4	5.0	1.36	2.54	0.84	7.61	35.14	0	1.35	0.37	0.04	0.01	0.01	0.01	0.02	0	49.30

Legend

C6H6 - Benzene
MONO - Monochlorobenzene
META - Metachlorobenzene
PARA - Paradichlorobenzene
ORTHO - Orthodichlorobenzene
135 - 135 Trichlorobenzene
124 - 124 Trichlorobenzene
123 - 123 Trichlorobenzene
NB - Nitrobenzene
1245 - 1245 Tetrachlorobenzene
1234 - 1234 Tetrachlorobenzene
MCNB - Monochloronitrobenzene
PENTA - Pentachlorobenzene
HEXA - Hexachlorobenzene

- All concentrations in mg/L

Table 6

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-1

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gallons x1000)	Average Monthly Concentrations of Total Benzene Species (mg/l)	Total Benzene Species Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1989						
January	5.4	241,056	241	47.29	43.1	43.1
February	4.9	197,568	439	35.09	26.2	69.3
March	4.6	205,344	644	57.9	45.0	114.3
April	4.7	209,808	854	46.1	36.6	150.9
May	3.3	99,792	954	43.0	16.2	167.1
June	8.0	334,080	1,288	47.77	60.4	227.5
July	8.6	359,136	1,647	48.49	65.9	293.4
August	11.4	443,232	2,139	52.05	87.3	380.7
September	9.8	141,120	2,280	61.17	32.7	413.4
October	14.9	665,136	2,945	41.32	104.1	517.5
November	33.0*	1,425,600	4,371	58.69	316.9	834.4
December	31.6	1,410,624	5,782	79.17	423.0	1,257.4

* estimated, flow meter inoperable for a portion of the month.

Table 7

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-2

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gallons x1000)	Average Monthly Concentrations of Total Benzene Species (mg/l)	Total Benzene Species Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1989						
January	---	---	---	---	---	---
February	---	---	---	---	---	---
March	---	---	---	---	---	---
April	2.5	72,000	72	230.0	62.7	62.7
May	2.5	36,000	108	230.0	31.3	94.0
June	4.4	183,744	292	230.0	160.0	254.0
July	4.8	200,448	492	243.19	184.5	438.5
August	3.8	159,408	651	252.64	152.4	590.9
September	3.4	137,088	788	255.41	132.5	723.4
October	2.8	124,992	913	242.02	114.6	838.0
November	2.9	125,280	1,038	213.65	101.4	939.4
December	1.7	75,888	1,114	228.54	65.7	1,005.1

--- Pump inoperable

Table 8

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-3

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gallons x1000)	Average Monthly Concentrations of Total Benzene Species (mg/l)	Total Benzene Species Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1989						
January	---	---	---	---	---	---
February	---	---	---	---	---	---
March	---	---	---	---	---	---
April	---	---	---	---	---	---
May	---	---	---	---	---	---
June	7.1	184,032	184	77*	53.6	53.6
July	7.3	304,848	489	77*	88.8	142.4
August	7.8	334,368	823	77*	97.4	239.8
September	7.0	282,240	1,105	149.58	159.8	399.6
October	6.7	299,088	1,404	114.55	129.8	529.4
November	7.3	315,360	1,719	120.87	144.4	673.8
December	7.5	334,800	2,054	127.79	162.1	835.9

--- Pump inoperable

* Estimated concentration, sample was not collected.

Table 9

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-4

Month	Average Monthly Pumping Rate (GPM)	Total Monthly Pumpage (gallons)	Total Cumulative Pumpage (gallons x1000)	Average Monthly Concentrations of Total Benzene Species (mg/l)	Total Benzene Species Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1989						
January	6.3	281,232	281	44.02	46.9	46.9
February	7.1	286,272	567	35.09	38.0	84.9
March	5.5	245,520	813	61.28	56.9	141.8
April	5.2	224,640	1,037	83.8	71.3	213.1
May	4.0	149,760	1,187	52.14	30.0	243.1
June	4.3	173,376	1,360	51.1	33.5	276.6
July	7.0	292,320	1,652	40.77	45.1	321.7
August	9.7	416,016	2,068	41.61	65.5	387.2
September	9.3	374,976	2,443	55.14	110.6	497.8
October	9.7	433,008	2,876	44.18	72.5	570.3
November	9.9	427,680	3,304	46.54	75.4	645.7
December	7.3	315,360	3,619	49.30	58.9	704.6

* estimated concentration, sample not collected

Table 10

Monthly and Cumulative Monitor Well Pumpage
and Contaminant Recovery

Recovery Well RW-1, 2, 3 and 4

Month	Total Monthly Pumpage (gallons X1000)	Total Cumulative Pumpage (gallons X1000)	Total Benzene Species Recovered (kilograms)	Cumulative Total Benzene Species Recovered (kilograms)
1989				
January	522	522	90.0	90.0
February	483	1,005	64.2	154.2
March	450	1,455	101.9	256.1
April	505	1,960	170.6	426.7
May	284	2,244	46.2	472.9
June	874	3,118	93.9	566.8
July	1,156	4,274	384.3	951.1
August	1,353	5,627	402.6	1,353.7
September	935	6,562	435.6	1,789.3
October	1,522	8,084	421.0	2,210.3
November	2,293	10,377	638.1	2,848.4
December	2,136	12,513	709.7	3,558.1